# Willis River Water Quality Implementation Plan (Fecal Coliform TMDL) Executive Summary

**Submitted to:**

**The Stakeholders of the Willis River Watershed**
**On Behalf of**
**The Commonwealth of Virginia**
**Department of Conservation and Recreation and**
**Department of Environmental Quality**

**June 16, 2005**

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**Also available for this project:**
**The Willis River Water Quality Implementation Plan (Fecal Coliform TMDL) Technical Report**

## Introduction

The Willis River was listed as impaired on Virginia's 1998 Section 303(d) TMDL Priority List and Report due to violations of the State's water quality standard for fecal coliform (FC). The impaired stream segment has a length of 14.3 miles. TMDL is an acronym for Total Maximum Daily Load, which is the maximum amount of pollutant that a water body can assimilate without surpassing the state water quality standard. If the water body surpasses the water quality standard 10.5% of the time during an assessment period, the water body is placed on the Commonwealth of Virginia's 303 (d) List. After TMDL Plans are written, Virginia's 1997 Water Quality Monitoring Information and Restoration Act states in section 62.1-44.19:7 that the "Board shall develop and implement a plan to achieve fully supporting status for impaired waters". In fulfilling the state's requirement for the development of a TMDL Implementation Plan (IP), a framework was established for reducing FC and achieving the water quality goals for which TMDL allocations were developed. With successful completion of the implementation plan, the Willis River watershed will be well on the way to having "clean" streams and land and water resources will be enhanced. Additionally, development of an approved implementation plan will improve the localities chances for obtaining monetary assistance during implementation.

Key components of the implementation plan are discussed in the following sections:

- ◄ Review of the TMDL Development Study
- ◄ Process for Public Participation
- ◄ Assessment of Implementation Needs
- ◄ Cost/Benefit Analysis, and
- ◄ Implementation.

It has been documented time and again the detrimental effects of bacteria in food and water supplies. For example, on August 8, 1994, Virginia Department of Health (VDH) was notified of campers and counselors at a Shenandoah Valley

summer camp developing bloody diarrhea. *E. coli* 0157:H7 was confirmed as the causative agent. In Franklin County Virginia, in 1997, an outbreak of illnesses involving 3 children was attributed to *E. coli* (0157:H7) in Smith Mountain Lake. The children were exposed to the bacteria while swimming in the lake and a two year old that was hospitalized almost died as a result of the exposure (Roanoke Times, 1997). In August of 1998, seven children and two adults at a day-care center in rural Floyd County were infected with *E. coli* (0157:H7). Upon investigation, two of the property's wells tested positive for total coliform (Roanoke Times, 1998). On June 6, 2000, Crystal Spring (Roanoke Virginia's second largest water source) was shut down by VDH for *E. coli* contamination.

Isolated cases? No. Throughout the U. S., the Centers for Disease Control estimates that at least 73,000 cases of illnesses and 61 deaths per year are caused by this one fecal coliform pathogen (*i.e., E. coli* 0157:H7 bacteria) (CDC, 2001). Other fecal coliform pathogens (*e.g., E. coli* 0111) are responsible for similar illnesses. In addition, other bacterial and viral pathogens are indicated by the presence of fecal coliforms. Whether the source of contamination is human or livestock, the threat of these pathogens appears more prevalent as both populations increase. As stakeholders, we must assess the risk we are willing to accept and then implement measures to safeguard the public from these risks. Water quality standards are society's implementation of legislative measures resulting from an assessment of the acceptable risks.

This booklet is an abbreviated version of the full plan, which can be obtained by contacting Virginia Department of Conservation and Recreation (VADCR) or Virginia Department of Environmental Quality (VADEQ) offices.

**Review of TMDL Development Study**

The Willis River is part of the James River Basin, located in Cumberland and Buckingham Counties in Virginia. The land

area of the Willis River watershed is approximately 117,935 acres, with woodlands and pasture as the primary land uses (Figure 1.). The watershed is comprised of forest (75%), agricultural (21%), wetlands (2%), water (1%), and urban (1%) land uses. The estimated population within the Willis River drainage area in 2001 was 7,682.

The reductions in bacteria sources due to human-induced pollution outlined in the Willis River TMDL are :

- All livestock must be excluded from the river.
- All straight pipes must be identified and corrected.
- Implicit in the requirement for correction of straight pipes is the need to maintain all functional septic systems.
- Although there is no reduction of land-applied fecal material, there is an implicit need to maintain loadings at or below the current levels, and
- Water quality monitoring during implementation of the TMDL will be used to determine if growth trends are impacting water quality.

The Willis River TMDL Implementation Plan focuses on human and livestock reductions. Water quality modeling has shown that the Willis River can be removed from the impaired waters list by addressing human and livestock sources of bacteria. If water quality goals are not achieved after addressing these sources, wildlife reductions may be addressed or a process could be initiated (*i.e.,* use attainability analysis) to change the designated use of the Willis River. The current designated use is full contact recreation, which includes swimming. Virginia allows the adoption of a secondary contact designated use in the case that the human and livestock sources are addressed to the maximum extent practicable and water quality goals are still not being obtained.

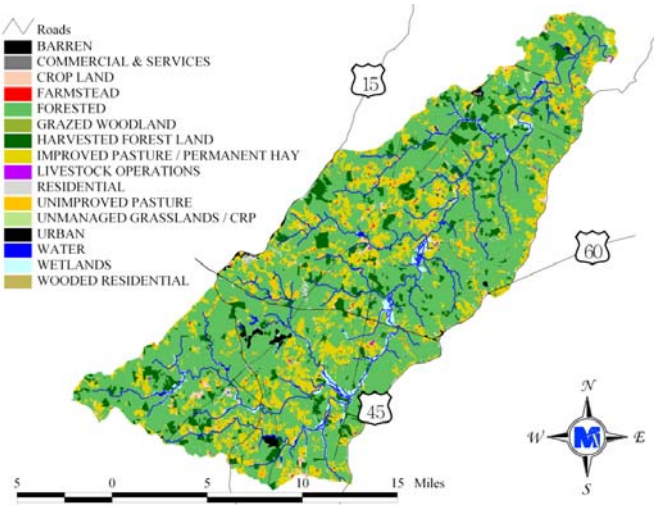



**Figure 1. Land uses in the Willis River Watershed.**

## Process for Public Participation

The actions and commitments described in this document are drawn together through input from citizens of the watershed, the Buckingham and Cumberland County governments, VADCR, VADEQ, VDH, Virginia Cooperative Extension (VCE), Natural Resources Conservation Service (NRCS), Peter Francisco Soil and Water Conservation District (PFSWCD), James River Association (JRA), Farm Bureau and MapTech, Inc. Every citizen and interested party in the watershed is encouraged to become involved in implementing the IP and contributing what they are able to help restore the health of the streams.

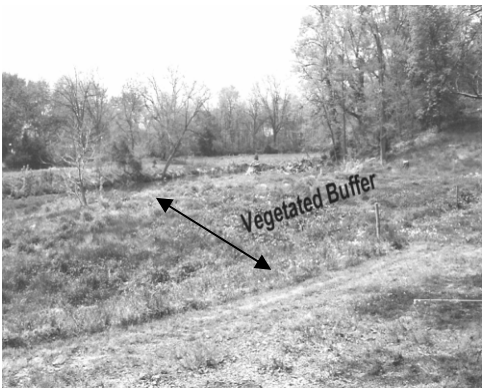
Public participation took place on three levels. First, public meetings were held to provide an opportunity for informing the public as to the end goals and status of the project, as well as for soliciting participation in the smaller, more targeted meetings (*i.e.,* working groups and steering committee). Second, working groups were assembled from commu-

nities of people with common concerns regarding the implementation process. These were the primary arenas for public input. Working groups consisted of the following: Agricultural, Residential, and Governmental. A representative from VADCR or MapTech attended each working group in order to facilitate the process and integrate information collected from the various communities. Third, a Steering Committee was formed with representation from the Agricultural, Residential and Governmental Working Groups, VADCR, VADEQ, VDH, PFSWCD, NRCS, JRA, VCE, local government agencies and MapTech, and had the expressed purpose of guiding the development of the IP. Over 260 man-hours were devoted to attending these meetings by individuals representing agricultural, residential, commercial, and government interests on a local, state, and federal level.

Throughout the public participation process, major emphasis was placed on discussing best management practices (BMPs), BMP specifications, locations of control measures, education, technical assistance, and funding.

**Working Groups and Steering Committee**

The Agricultural Working Group (AWG) consisted predominantly of beef producers, agency representatives and MapTech personnel. The AWG decided that the Conservation Reserve and Enhancement Program (CREP) and grazing land protection system (SL-6) were the most promising programs/ practices for beef operations in the watershed.



The total cost of livestock exclusion systems includes not only the costs associated with fence installation, repair, and maintenance, but also the cost of taking land (*e.g.,* 35-ft buffer area) out of production. The cost of fence maintenance was identified as a deterrent to participation. Financial assistance possibilities for maintaining fences include an annual 25% tax credit for fence maintenance and conservation easements where the landowner is paid a percentage of the land value to leave it undisturbed. Additionally, the Stream Protection (WP-2T) cost-share practice will be available as part of the implementation project and provides an incentive payment to maintain stream fencing. It was noted that IP participation is not currently mandatory, but might become mandatory later. Waiting for regulations to force IP compliance is not the best action because funding is available now. The AWG also discussed methods to publicize the implementation project to the agricultural community including field days, workshops and talks at Farm Bureau and Cattlemen's Association meetings.

The Governmental Working Group (GWG) contained members from Cumberland County Government, VADCR, VADEQ, PFSWCD, and VDH. The group identified technical and financial resources currently in place that could support implementation and identified legal and regulatory controls to facilitate such participation. The NRCS will provide financial and technical assistance through the Environmental Quality Incentives Program (EQIP). The PFSWCD will provide financial and technical assistance to farmers through the Virginia Agricultural BMP Cost-Share and Tax Credit Programs. The VDH will assist in locating straight pipes and refer landowners to the PFSWCD. The group also discussed the monitoring plan that will be used to evaluate progress of the implementation project.

The purpose of the Residential Working Group (RWG) was to develop a plan to (1) identify and eliminate straight pipes of wastewater from dwellings and businesses, (2) identify difficulties faced by landowners in correcting these prob-

lems, (3) identify potential means of funding corrections, (4) evaluate the technical assistance needed to administer the program, and (5) determine educational tools that are most likely to help. The RWG discussed focusing on clusters of homes close to the river to identify straight pipes and failing septic systems. The group discussed ways to contact citizens about the program including fliers, mailings and door hangers. The group stressed that the financial incentives that come along with the TMDL implementation program need to be a focal point. Word of mouth was also identified as a highly effective tool in getting people educated and involved in the project. The group also discussed the possibility of presenting this information to schools in an effort to educate parents through their children. The RWG discussed which local entity would be responsible for administration of the residential program. The PFSWCD will take the duties administering the program, while the VDH will assist the district through permit writing, inspections, and referring citizens to the district for financial assistance opportunities.

Reports from each working group to the steering committee are included as appendices of the *Willis River Water Quality Implementation Plan Technical Report.*

The Steering Committee consisted of representatives from the Agricultural, Residential, and Governmental Working groups, VADCR, VADEQ, PFSWCD, VDH, NRCS, JRA, VCE, local government agencies and MapTech. The Steering Committee discussed how to get more participation from producers, implementation needs, and potential funding resources available.

**Assessment of Needs**

The quantity of control measures, or BMPs, required during implementation was determined through spatial analyses of land use, stream-network, and the USDA Common Land Unit Layer (CLU) along with regionally appropriate data archived in the DCR Agricultural BMP Database and TMDL development documents. The map layers and archived data

were combined to establish high and low estimates of control measures required overall, in the watershed, and in each sub-watershed. Additionally, input from citizens, local agency representatives and contractors was used to verify the analyses. Estimates of control practices needed for full implementation in the watershed are listed in Table 1.

**Table 1. Estimation of average control measures with unit cost needed during implementation for agricultural and residential programs in the Willis River watershed.**

| Control Measure | Unit | Estimated Unit Needs (#) | Average Cost/Unit ($) |
|---|---|---|---|
| *Agricultural Program* | | | |
| Full Exclusion System (SL-6) | system | 218 | 9,000 |
| Stream Protection (WP-2T) | system | 100 | 3,400 |
| Streamside Fencing Replacement | feet | 35,720 | 3.00 |
| *Residential Program* | | | |
| On-site waste treatment system (RB-4, RB-5) | system | 5 | 12,500[1] |
| Septic System Pump-out Program (RB-1) | system | 100 | 225 |
| *Overall Implementation Effort* | | | |
| Technical & Administrative Assistance | work-year | 10 | 30,000 |

[1]Cost represents average of standard septic system and alternative waste treatment system.

There are approximately 256 miles of perennial stream in the watershed. The length of fencing required on perennial streams in the Willis River watershed is approximately 90 miles of fence. There are 218 Grazing Land Protection Systems (SL-6) and 100 Stream Protection Systems (WP-2T) expected to be implemented to insure full exclusion of livestock from the streams. The Steering Committee recognized that maintenance of fencing would add a significant cost. In order to estimate maintenance costs, it was assumed that 7.5% of installed fencing would need to be replaced during implementation, at an average cost of $3 per foot of fence replaced.

The SL-6 system includes streamside fencing, cross-fencing for pasture management, hardened crossings, alternative watering systems, and a 35-ft buffer from the stream. The WP-2T system is similar to the SL-6 system but does not include an alternative watering system or cross-fencing. Streamside fencing replacement has been added to WP-2T to provide additional funding if the practice is destroyed by flooding.

The IP focuses on fencing livestock from perennial streams because the TMDL report showed that more violations of the FC standard occurred during dry conditions. It is assumed that intermittent streams will be dry during these periods. Voluntary fencing could be implemented along intermittent streams and the 35-ft buffer requirement for cost-share fencing on perennial streams would not apply.

In discussion with the Steering Committee and Residential Working Group, it was decided that budgeting should be based on correcting five straight pipes. This was the number of straight pipes reported in the TMDL. All straight pipes must be identified and replaced during implementation since a 100% load reduction from straight pipes was deemed necessary to meet the TMDL goal.


The Governmental and Residential Working groups agreed that the septic tank pump-out practice (RB-1) should also be part of the residential implementation program. Septic system maintenance has historically received little attention in Buckingham and Cumberland Counties. The septic system pump-out program will serve to maintain the operation and performance of septic tank systems as well as to improve water quality by identifying systems that may need some improvements. In order to estimate the potential costs of the septic system pump-out, it was assumed that homes within 300 feet of a stream and built prior to 1990 will need to have one pump-out during the 5-year implementation period. MapTech GIS software was used to estimate a maximum of 281 septic systems pump-outs during the implementation project and a projection of 100 pump-outs was used for the estimated cost.

To determine the number of full time equivalents (FTE) considered necessary for agricultural technical assistance during implementation, the total number of practices needed to be installed per year during implementation was divided by the number of BMPs that one FTE can process in a year. In determining the maximum needed technical assistance, it was assumed that all practices would need some level of technical assistance. The number of FTE required was calculated based on estimates provided by the PFSWCD that one FTE can design and provide technical input for 151 livestock exclusion systems in five years. As a result, 2.1 agricultural technical FTEs are needed to provide technical assistance throughout the Willis River implementation. The number of agricultural technical assistance was rounded to 2.0. Due to the low number of straight pipes identified in the Willis River watershed, the AWG and Steering Committee decided that the Technical FTE will assume the responsibility of both the agricultural and residential programs.

**Implementation**

Potential funding sources available during implementation were identified during plan development. Detailed description of each source can be obtained from the PFSWCD, VADCR, NRCS, VCE, and VADEQ. Sources include:

- Federal Clean Water Act Section 319 Increment Funds
- Virginia Agricultural Best Management Practices Cost-Share Program
- Virginia Agricultural Best Management Practices Tax Credit Program
- USDA Environmental Quality Incentives Program (EQIP)
- Virginia Revolving Loan Programs (Agricultural BMPs and onsite sewage disposal systems)
- Virginia Water Quality Improvement Fund
- USDA Conservation Reserve Enhancement Program (CREP)

During implementation, standards, specifications, cost-share,

and tax credits for practices under the Virginia Agricultural BMP Cost-Share Program will be followed for funding eligibility. The SL-6 and WP-2T practices have a 75% cost-share through this program not to exceed $50,000, per participant in a given program year. The WP-2T has a one time stream fencing maintenance incentive payment of $0.50 per linear foot. The practices, RB-1, RB-4 and RB-5 have a 50% to 75% cost-share rate.

**Table 2. One possible scenario for funding costs in the first year of implementation.**

| Funding Source | Cost/Year ($) |
|---|---|
| ***TMDL Incentive Funds*** | |
| Agricultural Practices | 353,337 |
| Residential Practices | 15,000 |
| Septic Tank Pump-Out Program | 2,250 |
| Technical Assistance | 30,000* |
| **Subtotal** | **400,587** |
| ***Landowner*** | |
| Agricultural Practices | 117,779 |
| Residential Practices | 10,000 |
| Septic Pump-Out Program | 2,250 |
| **Subtotal** | **130,029** |
| **Total** | **$530,616** |

*****Based on starting with one FTE instead of two as projected in plan.

One possible scenario for funding in the first year is presented in Table 2. This scenario represents 20% installation of needed agricultural systems addressing livestock exclu-

sion (*i.e.,* SL-6, WP-2T), 40% of straight pipes replaced (*i.e.,* two straight pipes with waste treatment systems), and one technical FTE. The cost of a waste treatment system was estimated as an average of an alternative and standard septic system.

Progress toward end goals will be assessed during implementation through tracking of control measure installations by PFSWCD, VDH and VADCR, and continued water quality monitoring to be conducted by VADEQ. Citizen's monitoring support will be coordinated with the James River Association to augment the DEQ monitoring program and be used as an educational outreach component during implementation.

Implementation is scheduled to begin in August 2005 after which five milestones need to be met over the next five years (Figure 2). The first milestone will be one year after implementation begins, whereby 20% of the livestock exclusion systems and 40% of the residential control measures will be installed with a 14% to 19% expected reduction in violations of the geometric mean FC water quality standard. The fifth year milestone will be full implementation. Compliance with the FC standard will be anticipated within five years of full implementation, to allow for lag time in BMP effectiveness and stabilization of bacteria populations in the streams. If, prior to the 5-year milestone, water quality improves to the point that the Willis River can be de-listed (10.5% or less violation rate of the instantaneous standard), the Steering Committee will evaluate the cost-share requests and monitoring data to determine whether the project timeline should be revised.

Based on meeting the above milestones, a five-year implementation plan outline was formulated as depicted in Tables 3 and 4. Cost associated with percentage of practices installed addressing agricultural and residential practices along with technical assistance is shown in Table 5.

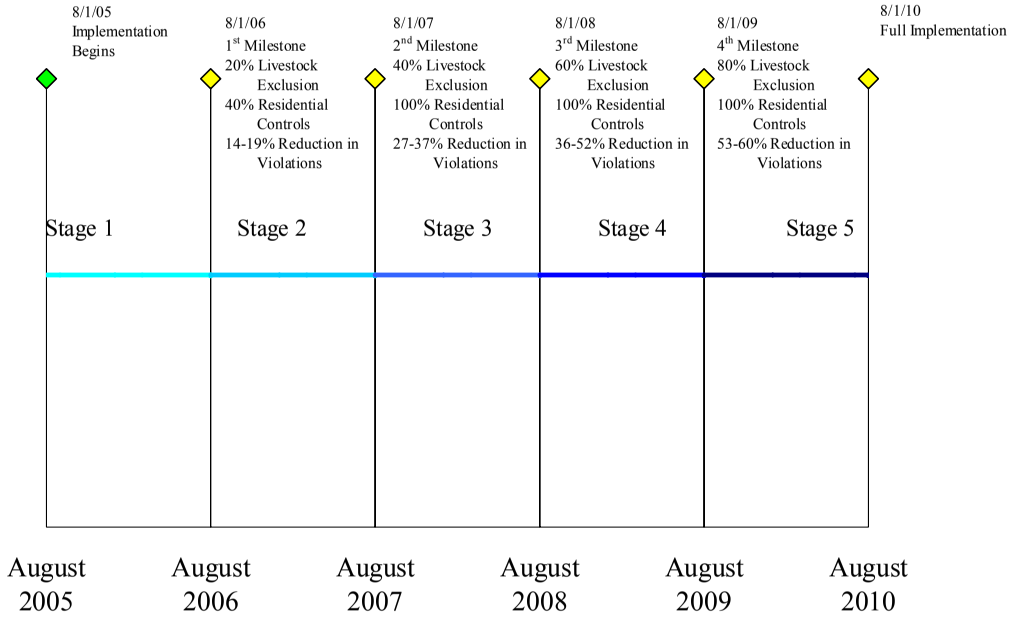



**Figure 2. Implementation milestones for Willis River.**

**Table 3. Implementation and water quality milestones (*i.e.*, estimation of FC geometric mean water quality standard exceedances) in the Willis River Watershed.**

| Milestone | Year | Implementation Milestone | | Reduction in Violations of the FC Geometric Mean (%) |
|---|---|---|---|---|
| | | Livestock Exclusion Systems | Straight Pipes Corrected | |
| 1 | 2006 | 20% | 40% | 14-19 |
| 2 | 2007 | 40% | 100% | 27-37 |
| 3 | 2008 | 60% | 100% | 36-52 |
| 4 | 2009 | 80% | 100% | 53-60 |
| 5 | 2010 | 100% | 100% | 63-77 |
| 6 | 2015 | De-listing from 303(d) List | | 100 |

**Table 4. Percentage of practices to be installed addressing livestock exclusion and straight pipes with amount of technical assistance needed in Willis River watershed.**

| Date (year) | Livestock Exclusion (%) | Straight Pipes (%) | Technical Assistance (FTE) |
|---|---|---|---|
| 1 | 20 | 40 | 2 |
| 2 | 20 | 60 | 2 |
| 3 | 20 | 0 | 2 |
| 4 | 20 | 0 | 2 |
| 5 | 20 | 0 | 2 |
| **Total** | **100** | **100** | **10** |

Implicit in the process of a staged implementation is targeting of control measures. Targeting ensures optimum utilization of resources. Targeting of critical areas for BMP installation was accomplished through analysis of landuse, farm boundaries, stream network GIS layers, and monitoring results. Monitored data collected during the TMDL development process was used together with spatial analysis results to identify subwatersheds where initial implementation resources would result in the greatest return in water quality improvement.

If feasible, effort should be made to prioritize resources in the following order of subwatersheds: 8, 7, 6, 1, 2, 5, 3, 4, and 9 (see Figure 4). These subwatersheds were ranked according to the number of animals per length of fence needed.

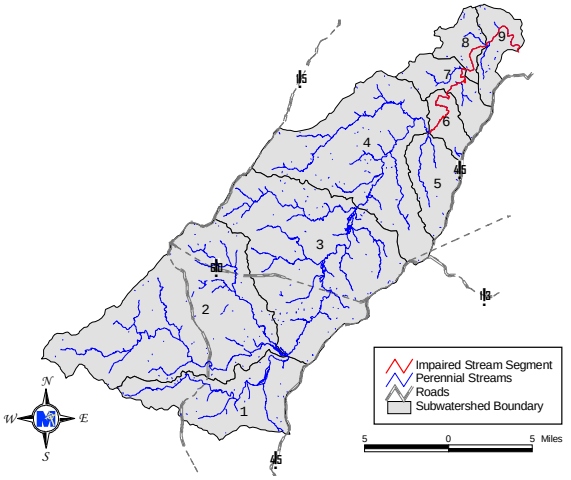



**Figure 3. Location of Willis River impaired segment and subwatersheds.**

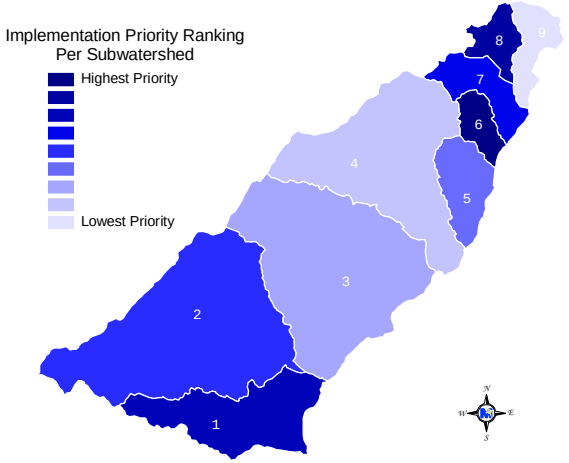



**Figure 4. Willis River subwatersheds by implementation priority ranking.**

**Table 5. Cost associated with percentage of practices installed addressing agricultural and residential practices along with technical assistance needed in Willis River.**

| Date | Agricultural BMPs | Residential BMPs | Septic Pump-out Program | Technical Assistance | Estimated Total Cost Per Year |
|---|---|---|---|---|---|
| (year) | ($) | ($) | ($) | ($) | ($) |
| 1 | 471,116 | 25,000 | 4,500 | 60,000 | 560,616 |
| 2 | 471,116 | 37,500 | 4,500 | 60,000 | 573,116 |
| 3 | 471,116 | 0 | 4,500 | 60,000 | 535,616 |
| 4 | 471,116 | 0 | 4,500 | 60,000 | 535,616 |
| 5 | 471,116 | 0 | 4,500 | 60,000 | 535,616 |
| 6 - 10 | 53,580 [1] | 0 | 0 | 0 | 53,580 |
| **Total** | **$2,409,160** | **$62,500** | **$22,500** | **$300,000** | **$2,794,160** |

[1]Represents costs to replace or repair stream fencing.

**Cost / Benefit Analysis**

Associated cost estimations of systems needed for full livestock exclusion reductions were calculated by multiplying the unit cost by the estimated number of units in each subwatershed (Table 1). As depicted in Table 6, the amount needed to install control measures that will ensure full livestock exclusion from streams in the watershed is $2,409,160 excluding technical assistance.


Cost estimations to replace identified straight pipes were based on the combination of new septic systems or alternative waste treatment systems. Without site surveys at each location where system replacement/installation is required, it is difficult to determine the proportion of sites needing alternative systems. In this light, it was assumed that sites were evenly split between needing standard systems (*i.e.,* septic systems) and alternative systems (*e.g.,* peat moss filter systems). The total cost estimated for replacement/installation of private sewage systems was $62,500.

It was determined by the PFSWCD, VADCR, VDH, and Steering Committee members that it would require $30,000 to support the salary, benefits, travel, training, and incidentals for education of one technical FTE. With quantification analysis yielding a need for 2 technical FTEs per year the maximum total cost to provide technical assistance during implementation is expected to be $300,000 over 5 years (Table 6). The PFSWCD suggested that one staff member

be hired to begin with but the possibility should be kept open to hire another if the need arises.

**Table 6. Estimated total implementation cost for agriultural BMPs, residential BMPs, and technical assistance in Willis River Watershed.**

| Implementation Needs | Average Total Cost ($) |
|---|---|
| Agricultural BMPs | 2,409,160 |
| Residential BMPs | 62,500 |
| Septic System Pump-Out Program | 22,500 |
| Technical & Administrative Assistance | 300,000 |
| **Total** | **$2,794,160** |

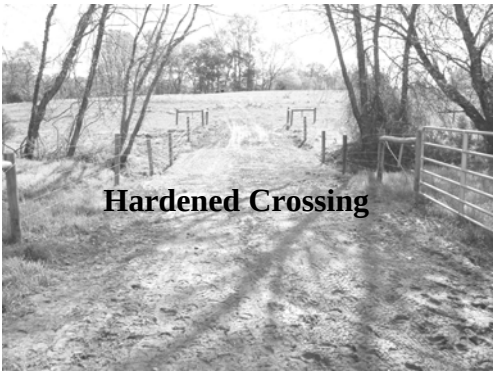
The primary benefit of implementation is cleaner waters in Virginia. Specifically, fecal contamination in Willis River will be reduced to meet water quality standards. It is hard to gage the impact that reducing fecal contamination will have on public health, as most cases of waterborne infection are not reported or are falsely attributed to other sources. However, because of the

reductions required, the incidence of infection from fecal sources, through contact with surface waters, should be reduced considerably. Additionally, because of streambank protection that will be provided through exclusion of livestock from streams the aquatic habitat will be improved in these waters. The vegetated buffers that are established will also serve to reduce sediment and nutrient transport to the stream from upslope locations. In areas where pasture management is improved through implementation of grazing-land protection BMPs, soil and nutrient losses should be reduced, and infiltration of precipitation should be increased, decreasing peak flows downstream. Reductions in nutrient and sediment loadings will help in attaining nutrient and sediment reduction goals for the *Commonwealth of Virginia Chesapeake Bay Nutrient and Sediment Reduction Tributary Strategy for the James River Basin, April 2005.*

An important objective of the implementation plan is to foster continued economic vitality and strength. This objective is based on the recognition that healthy waters improve economic opportunities for Virginians and a healthy economic base provides the resources and funding necessary to pursue restoration and enhancement activities. The agricultural and residential practices recommended in this document will provide economic benefits to the landowner, as well as, the expected environmental benefits. Specifically, alternative (clean) water sources, exclusion of livestock from streams, intensive pasture management, and private sewage system maintenance will each provide economic benefits.

**Watering System**

A clean water source has been shown to improve weight gain and milk production in cattle. Fresh clean water is essential for livestock production, with healthy cattle consuming, on a daily basis, close to 10% of their body weight during winter and 15% of their body weight in summer. Many livestock illnesses can be spread through contaminated water supplies. For instance, coccidia can be delivered through feed, water and haircoat contamination with manure (VCE, 2000). In addition, horses drinking from marshy areas or areas where wildlife or cattle carrying leptospirosis have access tend to have an increased incidence of moonblindness associated with leptospirosis infections (VCE, 1998b). A clean water source can prevent illnesses that reduce production and incur the added expense of avoidable veterinary bills. In addition to reducing the likelihood of animals contracting waterborne illnesses by providing a clean water supply, streamside fencing excludes livestock from wet, swampy environments as are often found next to




streams where cattle have regular access. Keeping cattle in clean dry areas has been shown to reduce the occurrence of mastitis and foot rot. The Virginia Cooperative Extension (1998a) reports that mastitis currently costs producers $100 per cow in reduced quantity and quality of milk produced. On a larger scale, mastitis costs the U.S. dairy industry about $1.7-2 billion annually or 11% of total U.S. milk production. While the spread of mastitis through a dairy herd can be reduced through proper sanitation of milking equipment, mastitis-causing bacteria can be harbored and spread in the environment where cattle have access to wet and dirty areas. Implementation of streamside fencing and well managed loafing areas will reduce the amount of time that cattle have access to these areas.

Taking the opportunity to initiate an improved pasture management system in conjunction with installing clean water supplies will also provide economic benefits for the producer. Improved pasture management can allow a producer to feed less hay in winter months, increase stocking rates by 30 - 40% and, consequently, improve the profitability of the operation. With feed costs typically responsible for 70-80 percent of the cost of growing or maintaining an animal, and pastures providing feed at a cost of 0.01-0.02 cents/lb of total digestible nutrients (TDN) compared to 0.04-0.06 cents/lb TDN for hay, increasing the amount of time that cattle are fed on pasture is clearly a financial benefit to producers (VCE, 1996). Standing forage utilized directly by the grazing animal is always less costly and of higher quality than the same forage harvested with equipment and fed to the animal. In addition to reducing costs to producers, intensive pasture management can boost profits by allowing higher stocking rates and increasing the amount of gain per acre. A side benefit is that cattle are more closely confined, allowing for quicker checking and handling. In general, many of the agricultural BMPs being recommended will provide both environmental benefits and economic benefits to the farmer.

The residential programs will play an important role in im-

proving water quality, since human waste can carry human viruses in addition to the bacterial and protozoan pathogens that all fecal matter can potentially carry with it. In terms of economic benefits to homeowners, an improved understanding of private sewage systems, including knowledge of what steps can be taken to keep them functioning properly and the need for regular maintenance, will give homeowners the tools needed for extending the life of their systems and reducing the overall cost of ownership. The average septic system will last 20-25 years if properly maintained. Proper maintenance includes: knowing the location of the system components and protecting them (*e.g.* by not driving or parking on top of them, and not planting trees where roots could damage the system), keeping hazardous chemicals out of the system, and pumping out the septic tank every three to five years. The cost of proper maintenance, as outlined here, is relatively inexpensive in comparison to repairing or replacing the entire system.

**Monitoring**

Implementation progress success will be determined by monitoring conducted by VADEQ through the agency's monitoring program and citizen monitoring support funded through the James River Association. VADEQ will monitor at 14 monitoring locations in the Willis River watershed (Figure 5 and Table 7). Three of the stations will be monitored indefinitely on a bi-monthly basis during implementation. An additional 11 ambient watershed stations will be monitored on a 6-year rotating schedule. The rotating stations will be sampled bi-monthly for two years and then monitoring will be discontinued for a period of four years.

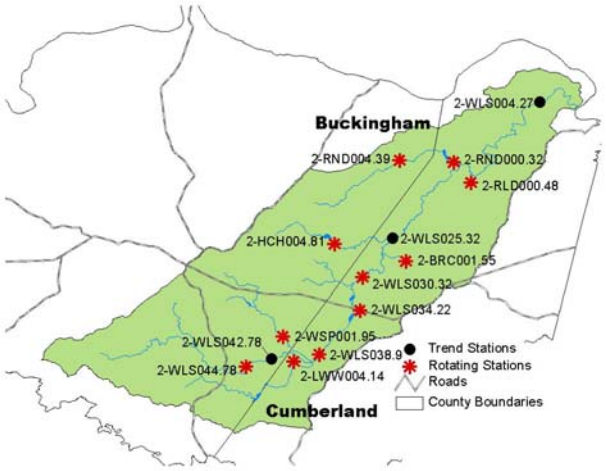



**Figure 5. Location of DEQ Monitoring Stations.**

**Table 7. Monitoring station IDs, station locations, station types, and monitoring schedules.**

| Station ID | Station Location | Station Type | Monitoring Period |
|---|---|---|---|
| 2-WLS004.27 | Rt. 605 Bridge | Ambient Trend | -- |
| 2-WLS025.32 | Rt. 622 Bridge | Ambient Trend | -- |
| 2-BRC001.55 | Near Dam- Bear Creek Lake | Ambient Watershed | 2003-2005 |
| 2-HCH004.81 | Hatcher Creek at Rt. 667 Bridge | Ambient Watershed | 2001-2003 |
| 2-RLD000.48 | Reynolds Creek @ Rt. 615 Bridge | Ambient Watershed | 2003-2005 |
| 2-RND000.32 | Randolph Creek @ Rt. 613 Bridge | Ambient Watershed | 2003-2005 |
| 2-RND004.39 | Randolph Creek @ Rt. 717 | Ambient Watershed | 2005-2007 |
| 2-WLS030.32 | Forest Rd. between Rt.629 & 626 | Ambient Watershed | 2003-2005 |
| 2-WLS034.22 | Rt. 60 bridge near Ca Ira Rd. | Ambient Watershed | 2001-2003 |
| 2-WLS044.78 | Willis River @ Rt. 621 | Ambient Watershed | 2005-2007 |
| 2-LWW004.14 | Little Willis @ Rt. 676 | Ambient Watershed | 2005-2007 |
| 2-WSP001.95 | Whispering Creek @ 654 | Ambient Watershed | 2005-2007 |
| 2-WLS038.90 | Willis River @ Rt. 634 | Ambient Watershed | 2005-2007 |
| 2-WLS042.78 | Rt. 600 Bridge | Ambient Trend | -- |

**Education**

The PFSWCD will be in charge of initiating contact with farmers in the Willis River watershed to encourage the installation of cattle exclusion systems. This one-on-one contact will facilitate communication of the water quality problems and the corrective actions needed. The PFSWCD will conduct a number of outreach activities in the watershed to promote participation and community support to obtain the agricultural program milestones and to make the agricultural community aware of the TMDL requirements. Such activities will include information exchange through newsletters, mailings, field days, organizational meetings, etc. The PFSWCD will work with appropriate organizations such as Virginia Cooperative Extension to educate the public.

**Stakeholders Roles and Responsibilities**

Achieving the goals of this effort (*i.e.,* improving water quality and removing these waters from the impaired waters lists) is without a doubt dependent on stakeholder participation. Both the local stakeholders charged with implementation of control measures, and the stakeholders charged with overseeing our nation's human health and environmental programs must first acknowledge there is a water quality problem and then make changes as needed in our operations, programs, and legislations to address these pollutants.

The United States Environmental Protection Agency (EPA) has the responsibility of overseeing the various programs necessary for the success of the Clean Water Act (CWA). However, administration and enforcement of such programs falls largely to the states. In the Commonwealth of Virginia, water quality problems are dealt with through legislation, incentive programs, education, and legal actions. Currently, there are four state agencies responsible for regulating activities that impact water quality with regard to this implementation plan. These agencies include: VADEQ, VADCR, Virginia Department of Agriculture and Consumer Services (VDACS), and VDH.

VADEQ has responsibility for monitoring the waters to determine compliance with state standards, and for requiring permitted point dischargers to maintain loads within permit limits. They have the regulatory authority to levy fines and take legal action against those in violation of permits. Beginning in 1994, animal waste from confined animal facilities in excess of 300 animal units (cattle and hogs) has been managed through a Virginia general pollution abatement permit. These operations are required to implement a number of practices to prevent groundwater contamination. In response to increasing demand from the public to develop new regulations dealing with animal waste, in 1999 the Virginia General Assembly passed legislation requiring VADEQ to develop regulations for the management of poultry waste in operations having more than 200 animal units of poultry (about 20,000 chickens) (ELI, 1999).

VADCR holds the responsibility for addressing nonpoint sources (NPS) of pollution. Most VADCR programs dealing with agricultural NPS pollution historically have been through education and voluntary incentive programs. These cost-share programs were originally developed to meet the needs of voluntary partial participation and not the TMDL-required 100% participation of stakeholders. To meet the needs of the TMDL program and achieve the goals set forth in the CWA, the incentive programs must be reevaluated to account for 100% participation. It should be noted that VADCR does not have regulatory authority over the majority of NPS issues addressed here.

In the permit application, conservation easements were identified as the preferred mitigation measure. The proposed reservoir mitigation plan would result in placing conservation easements on areas of riparian buffers installed as part of the Willis River TMDL Implementation Plan. Conservation easements are voluntary agreements with a landowner that preserve land for a specific period of time or in perpetuity. The landowner retains ownership rights with the exception of development. The proposed reservoir mitigation plan would

provide compensation to the landowner for the land placed in the conservation easement. This plan has the potential to provide additional benefits both to landowners and the water quality in the Willis River and assist in removing the Willis River from the impaired waters list.

Through Virginia's Agricultural Stewardship Act, VDACS Commissioner of Agriculture has the authority to investigate claims that an agricultural producer is causing a water quality problem on a case-by-case basis (Pugh, 2001). If deemed a problem, the Commissioner can order the producer to submit an agricultural stewardship plan to the local soil and water conservation district. If a producer fails to implement the plan, corrective action can be taken which can include a civil penalty up to $5,000 per day. The Commissioner of Agriculture can issue an emergency corrective action if runoff is likely to endanger public health, animals, fish and aquatic life, public water supply, etc. An emergency order can shut down all or part of an agricultural activity and require specific stewardship measures. The Agricultural Stewardship Act is entirely complaint-driven.

VDH is responsible for maintaining safe drinking water measured by standards set by EPA. Their duties also include septic system regulation and, historically, regulation of biosolids land application. Like VDACS, VDH is complaint-driven. Complaints can range from a vent pipe odor that is not an actual sewage violation and takes very little time to investigate, to a large discharge violation that may take many weeks or longer to effect compliance. In the scheme of these TMDLs, VDH has the responsibility of enforcing actions to correct or eliminate failed septic systems and straight pipes, respectively.

Cumberland County, along with its partner Henrico County, is pursuing the possibility of constructing a regional pumped storage reservoir near the James River. The preferred site of the proposed reservoir is located at Cobbs Creek in the northeastern portion of the county adjacent to the Willis River

watershed. In April 2005, Cumberland County and their contractor, Malcolm Pirnie, Inc., submitted a joint permit application for the project to the appropriate regulatory agencies. Included with this application was a "Wetlands and Stream Conceptual Mitigation Plan" to offset 32.1 acres of vegetated wetlands and 14 miles of stream channel impacted by the reservoir. Cumberland County expressed interest in focusing these mitigation efforts to the Willis River Watershed and expressed the desire to partner with VADCR and the PFSWCD to determine the type, location and extent of mitigation opportunities that have been identified during the Willis River Implementation Plan development. VADCR subsequently worked with Malcolm Pirnie to identify areas of potential mitigation opportunities.

State government has the authority to establish state laws that control delivery of pollutants to local waters. Local governments, in conjunction with the state, can develop ordinances involving pollution prevention measures. In addition, citizens have the right to bring litigation against persons or groups of people who can be shown to be causing some harm to the claimant. Through hearing the claims of citizens in civil court, and the claims of government representatives in criminal court, the judicial branch of government also plays a significant role in the regulation of activities that impact water quality.

The Clean Water Act Section 303(d) calls for the identification of impaired waters. It also requires that the stream be ranked by the severity of the impairment and a Total Maximum Daily Load be calculated for that stream that would bring its water back into compliance with the set water quality standard. Currently, TMDL implementation plans are not required in the Federal Code. However, Virginia State code does incorporate the development of implementation plans for impaired streams. The nonpoint source part of the Clean Water Act was largely ignored by EPA until citizens began to realize that regulating only point sources was no longer maintaining water quality standards. Beyond the initiation of

the CWA, the entire TMDL program has been complaint-driven. Lawsuits from citizens and environmental groups citing that EPA was not carrying out the statutes of the CWA began as far back as the 1970's and have continued until the present. In the state of Virginia in 1998, the American Canoe Association and the American Littoral Society filed a complaint against EPA for failure to comply with the provisions of §303d. The suit was settled by Consent Decree, which contained a TMDL development schedule through 2010. It is becoming more common for concerned citizens and environmental groups to turn to the courts for the enforcement of water quality issues.

Successful implementation depends on stakeholders taking responsibility for their role in the process. The primary role, of course, falls on the landowner. However, local, state and federal agencies also have a stake in seeing that Virginia's waters are clean and provide a healthy environment for its citizens. An important first step in correcting the existing water quality problem is recognizing that there is a problem and that the health of citizens, particularly those who are least able to protect themselves (*i.e.,* children), is at stake. While it is unreasonable to expect that the natural environment (*e.g.,* streams and rivers) can be made 100% free of risk to human health, it is possible and desirable to minimize manmade problems. Virginia's approach to correcting NPS pollution problems has been, and continues to be, encouragement of participation through education and financial incentives. However, if progress is not made toward restoring water quality using this voluntary approach, regulatory controls may be needed.

List of Acronyms

| | |
|---|---|
| AWG | Agricultural Working Group |
| BMP | Best Management Practice |
| CLU | Common Land Unit |
| CREP | Conservation Reserve and Enhancement Program |
| CWA | Clean Water Act |
| EPA | Environmental Protection Agency |
| EQIP | Environmental Quality Incentive Program |
| FC | Fecal Coliform |
| FTE | Full Time Equivalent |
| GWG | Governmental Working Group |
| IP | Implementation Plan |
| JRA | James River Association |
| NPS | Non Point Source Pollution |
| NRCS | Natural Resources Conservation Service |
| PFSWCD | Peter Francisco Soil and Water Conservation District |
| RB-1 | Septic System Pump-Out Program |
| RB-4 | Septic Tank Installation / Replacement |
| RB-5 | Alternative On-Site Waste Treatment System |
| RWG | Residential Working Group |
| SL-6 | Grazing Land Protection System |
| TMDL | Total Maximum Daily Load |
| VADCR | Virginia Department of Conservation and Recreation |
| VADEQ | Virginia Department of Environmental Quality |
| VCE | Virginia Cooperative Extension |
| VDACS | Virginia Department of Agriculture and Consumer Services |
| VDH | Virginia Department of Health |
| WP-2T | Stream Protection System |

# Willis River TMDL Implementation Plan Development

**June 16, 2005**

## Acknowledgements

**Steering Committee Members**
**Working Group Members**
&
Peter Francisco Soil & Water Conservation District
VADCR, VADEQ staff
County Government staff

## Total Maximum Daily Load

Maximum amount of pollutant that a water body can assimilate without surpassing state water quality standard.

## Presentation Outline

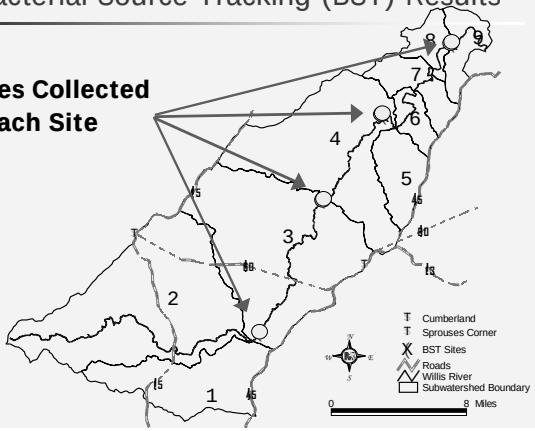
1. Review of TMDL Development
2. Public Participation
3. Assessment of Needs
4. Cost/Benefit Analysis
5. Implementation

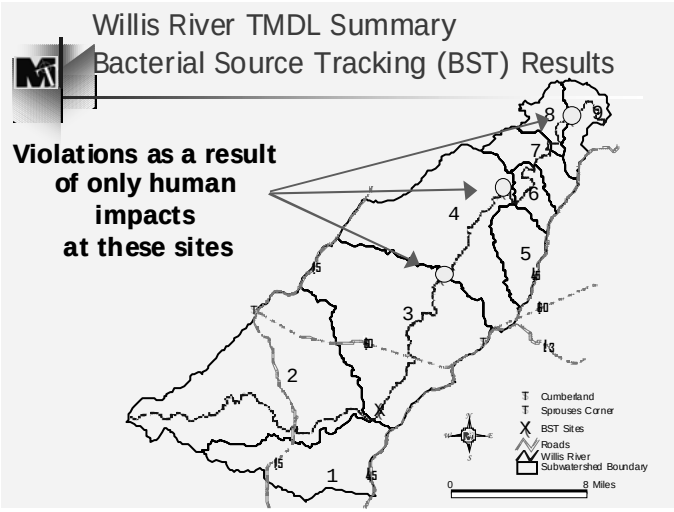
## Willis River TMDL Summary

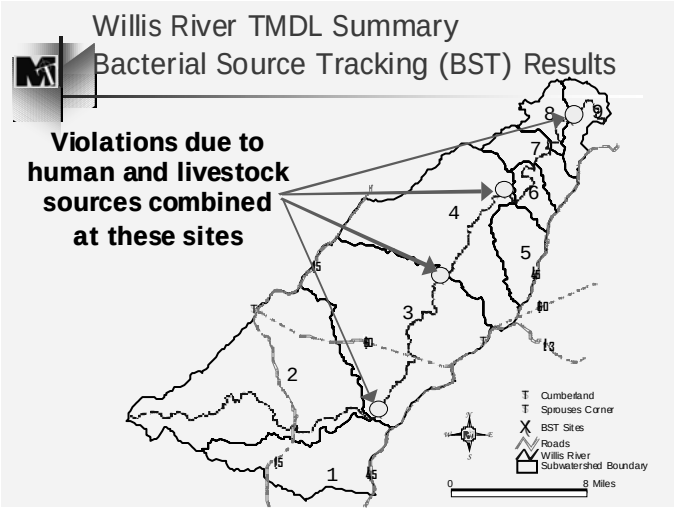
- Human & Livestock bacteria sources are addressed
  - All livestock excluded from streams
  - All straight pipes identified and corrected

## Willis River TMDL Summary
## Bacterial Source Tracking (BST) Results

**5 Samples Collected At Each Site**




Willis River TMDL Summary
Bacterial Source Tracking (BST) Results
Violations as a result of only human impacts at these sites
8
7
6
4
5
3
2
1
Cumberland
Sprouses Corner
BST Sites
Roads
Willis River Subwatershed Boundary
0
8 Miles


Willis River TMDL Summary
Bacterial Source Tracking (BST) Results
Violations due to human and livestock sources combined at these sites
8
7
6
4
5
3
2
1
Cumberland
Sprouses Corner
BST Sites
Roads
Willis River Subwatershed Boundary
0
8 Miles

## Public Participation

- Public Meetings
- Steering Committee Meetings
- Working Groups
  - Agricultural
  - Residential
  - Governmental

- Summary
  - Types of BMPs
  - Education and Technical Assistance
  - Concerns with Participation
  - Funding
  - Timeline

## Assessment of Needs

- Identification of BMPs
- Quantification of BMPs
  - Spatial Analysis
  - BMP Database Analysis
  - Input from Agricultural Working Group
- Technical Assistance and Education
  - BMP Database Analysis
  - Input from PFSWCD

## Assessment of Needs

*Agricultural BMPs*

- Livestock Exclusion
  - 256 miles of perennial streams
  - 90 miles of streamside fencing
  - 318 livestock exclusion systems

## Assessment of Needs

*Residential BMPs*

- 5 Straight Pipes to be Corrected
- 100 Septic System Pumpouts

## Assessment of Needs

*Technical Assistance*

- Agricultural and Residential Programs
  - Peter Francisco Soil & Water Conservation District
  - 2 Full-Time Employees
  - Support from Virginia Department of Health (VDH) on Residential Programs

## Estimated Total Cost

| | |
|---|---|
| **Agricultural Practices** | **$2,409,160** |
| **Residential Practices** | **$62,500** |
| **Septic Pumpouts** | **$22,500** |
| **Technical Assistance** | **$300,000** |
| **TOTAL** | **$2,794,160** |

## Livestock System

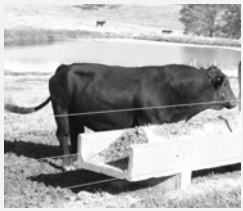
| | |
|---|---|
| **Water Source** | **$1,000 – $10,000** |
| **1,000 ft Streamside Fencing** | **$1,500 – $4,000** |
| **TOTAL** | **$2,500 – $14,000** |

## Private Sewage System

| | |
|---|---|
| **Septic System Pumpout** | **$225** |
| **Septic System Replacement** | **$5,000** |
| **Alternative System** | **$20,000** |

## Benefit Analysis

- Economic Benefit
  - Local Economy & Community
  - Agricultural Producers
  - Homeowners



- Water Quality Benefits
  - Human Health
  - Environmental Benefit

## Funding Sources

- $7,500 local cap has been lifted
- $50,000 state cap now applies
- Many funding sources available
  - EPA - 319 Incremental Funding
  - USDA - EQIP
  - USDA - CREP
  - Virginia Ag. BMP Cost-Share Program
  - Virginia Ag. BMP Tax Credit Program
  - Virginia Water Quality Improvement Fund
  - Virginia Revolving Loan Programs

## Funding Sources

Livestock System: Example Scenario 1

### VA State Cost-Share Program:

| | |
|---|---|
| System Cost | $9,000 |
| Design Cost (PFSWCD assistance) | $1,600 |
| 100% Assistance Funded (319 Incremental Funds) | -$1,600 |
| 75% Cost-Share | -$6,750 |
| 25% Tax Credit | -$560 |
| **Cost to Landowner** | **$1,690** |

## Funding Sources

Livestock System: Example Scenario 2

If regulatory authority or court action forces participation:

| | |
|---|---|
| System Cost | $9,000 |
| Design Cost | $1,600 |
| 0% Assistance Funded | -$0 |
| 0% Cost-Share | -$0 |
| 0% Tax Credit | -$0 |
| **Cost to Landowner** | **$ 10,600** |

## Funding Sources

Residential Septic System: Example Scenario 1

### VA State Cost-Share Program:

*For Household with Moderate Income 60-80% of Statewide Median Income*

| | |
|---|---|
| System Cost | $12,500 |
| 60% Cost-Share | -$7,500 |
| **Cost to Landowner** | **$5,000** |

## Funding Sources

Residential Septic System: Example Scenario 2

If regulatory authority or court action forces participation:

| | |
|---|---|
| System Cost | $12,500 |
| 0% Cost-Share | -$0 |
| Cost to Landowner | $12,500 |

## 5-Year Timeline

*Implementation and Technical Assistance*

| Date | Livestock Exclusion | Straight Pipes | Technical Assistance |
|---|---|---|---|
| (year) | (%) | (%) | (FTE) |
| 1 | 20 | 40 | 2 |
| 2 | 20 | 60 | 2 |
| 3 | 20 | 0 | 2 |
| 4 | 20 | 0 | 2 |
| 5 | 20 | 0 | 2 |
| **Total** | **100** | **100** | **10** |

## 10-Year Timeline

*Cost ($ Thousands)*

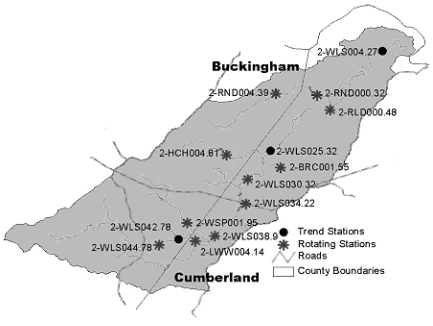
| Date | Agricultural BMPs | Residential BMPs | Septic Pumpout Program | Technical Assistance | Estimated Cost Per Year |
|---|---|---|---|---|---|
| (year) | ($) | ($) | ($) | ($) | ($) |
| 1 | 471,116 | 25,000 | 4,500 | 60,000 | 560,616 |
| 2 | 471,116 | 37,500 | 4,500 | 60,000 | 573,116 |
| 3 | 471,116 | 0 | 4,500 | 60,000 | 535,616 |
| 4 | 471,116 | 0 | 4,500 | 60,000 | 535,616 |
| 5 | 471,116 | 0 | 4,500 | 60,000 | 535,616 |
| 6 - 10 | 53,580 | 0 | 0 | 0 | 53,580 |
| **Total** | **$2,409,160** | **$62,500** | **$22,500** | **$300,000** | **$2,794,160** |

## Water Quality Milestones

| Milestone | Year | Implementation Milestone | | Reduction in Violations of the FC Geometric Mean (%) |
|---|---|---|---|---|
| | | Livestock Exclusion Systems | Straight Pipes Corrected | |
| 1 | 2006 | 20% | 40% | 14 - 19 |
| 2 | 2007 | 40% | 60% | 27 - 37 |
| 3 | 2008 | 60% | 100% | 36 - 52 |
| 4 | 2009 | 80% | 100% | 53 - 60 |
| 5 | 2010 | 100% | 100% | 63 - 77 |
| 6 | 2015 | DELISTING FROM 303(D) LIST | | 100 |

## Monitoring

- VADEQ
  - 14 monitoring lo
  - 3 bi-monthly mo
  - 11 ambient wate
  - Citizen monitorin James River Asso



## Education & Outreach

- Peter Francisco Soil and Water Conservation District
  - Newsletter specific to farmers
  - One-on-one communication
- Virginia Department of Health
  - Operation and maintenance of septic systems
- Virginia Cooperative Extension
  - Responds to specific needs of Virginia citizens
- James River Association

## Stakeholder's Role in Implementation

- Participation
  - Buckhingham and Cumberland County Residents
  - Peter Francisco Soil and Water Conservation District
  - Cumberland and Buckingham County Governments
  - VA Department of Conservation and Recreation
  - VA Department of Environmental Quality
  - VA Department of Health
  - VA Cooperative Extension
  - VA Department of Agricultural & Consumer Services
  - United States Environmental Protection Agency
  - USDA – Natural Resources Conservation Service

## Contacts

- Send written comments to: Jason Ericson, VADCR
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  Richmond, Virginia
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- Local contact: David B. Harris
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  Peter Francisco SWCD
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